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U. S. DEPARTMENT OF AGRICULTURE - FOREST SERVICE
California Forest and Range Experiment Station
Division of Forest Insect Research

EMERGENCE OF *Melanophila californica* Van Dyke FROM INFESTED JEFFREY PINE MT. LAGUNA, CALIFORNIA MAY-AUGUST, 1954

Mount Laguna is a recreational area located within the Cleveland National Forest of southern California. For many years this area has been managed for recreational use, and as part of this management program insect control projects have been carried out from time to time against the more destructive forest insects present. Jeffrey pine is the major tree species within this area and has as its most serious insect enemy the California flatheaded borer, *Melanophila californica* Van Dyke. Coulter pine is the second most prevalent tree species, covering a substantially smaller area than does Jeffrey pine. The western pine beetle, *Dendroctonus brevicomis* Lec., is the major insect killer of Coulter pine.

Direct control measures during the past several seasons have held western pine beetle populations within check; however, no control has been attempted against the California flatheaded borer. This insect has caused widespread losses to the Jeffrey pine stands of Mount Laguna and at present is epidemic throughout the greater portion of the area. Although it is believed that the California flatheaded borer could be brought under control by the use of penetrating oil sprays and fell-burn methods, the cost of doing so would be excessive. A possible alternative to either of these methods is an aerial spray program. Biological studies in northern California have shown that it is necessary for adults of *M. californica* to feed on the foliage of living pines before reaching sexual maturity. Thus an aerial spray application at the right time should result in the death of the adult beetles which feed on the sprayed foliage. If aerial spraying is effective, it offers a relatively inexpensive method of control.

Preliminary to field spraying tests, the emergence dates for *M. californica* need to be worked out for the area in which the spraying is to take place. This information is essential to the proper timing of an aerial spray application. This report covers a preliminary study of the emergence of *M. californica* at Mount Laguna during the period from late April to early August, 1954.

SELECTION OF CAGE LOCATIONS

Late in April 1954, seven cages were placed on standing infested Jeffrey pines at Mount Laguna, California by G. L. Downing and R. H. Cope of the California Forest and Range Experiment Station. These trees were all infested with *M. californica* in various stages of brood development. Many trees infested with broods of *M. californica* were examined to assure placement of the cages on trees representing the various brood stages present

in the area at the time of caging. Five trees were selected as representing all brood stages present in the area which would develop and emerge as adults during the 1954 season. The trees selected were located at various places within the area, all within two miles of each other and each one easily accessible to a road. To determine the dates of emergence and possibly the difference in numbers of beetles emerged by aspect -- i.e., north, south, east, and west -- cages were placed on both the north and south sides of two trees. It was felt that this would afford enough variation in placement of cages by aspect to indicate any decided differences in brood development from this influence.

TYPE OF TREE CAGE USED

The cages were all approximately the same size and constructed in the same manner. Each cage consisted of a strip of fine mesh window screen 5-feet long by 30-inches wide, with a large metal funnel soldered to the bottom edge of the wire screen. One side of the funnel lip was cut back and bent around to form an open side. This side was placed against the tree, with the other, or rounded, side of the funnel, to which the screen had been soldered, being away from the tree. A narrow path of bark 4-inches wide was shaved smooth, or nearly so, in the area where the edge of the screen was nailed to the tree. Sponge rubber weather stripping one-inch wide was placed between the bark and the edge of the screen and, using double-headed nails, the cage was placed on the tree. The nails were driven through the wire screen and sponge rubber and into the tree. The nails were spaced

Figure 1.--Tree cage on M. californica infested Jeffrey pine.

2 to 3 inches apart around the entire edge of the screen. An open-end glass jar lid was soldered to the bottom of the funnel. This allowed removal of the jar at frequent intervals to gather specimens. Water was placed in each jar to prevent the insects from dismembering each other. Salt was added to prevent freezing. The cages were placed on the trees so that the bottom of the screened areas was approximately 5 feet above the ground.

COLLECTION OF EMERGENCE DATA

Insects that emerged in the cages were collected at fairly regular intervals, usually every seven days, from May 8 to August 7. The collections were made by Raymond M. Rice, Assistant District Ranger, Descanso Ranger District, Cleveland National Forest. At the time of collection, all insects, regardless of species, were collected from each cage and placed in alcohol for future sorting and identification.

RESULTS

The following tables (pages 4 and 5) summarize the M. californica emergence data. This sample is not large enough to yield results of more than a very preliminary nature. However, there are a few generalizations that can be made from the study.

It will be noted from the tables that emergence in 1954 occurred over an extended period from at least May 8 to August 7 -- three months. Since many infested trees were examined in the area immediately prior to the first collection date and none were found to contain adults, it can be safely assumed that no appreciable emergence occurred prior to May 8. On the last collection date, August 7, there were still a few beetles emerging; therefore it is likely that some emergence occurred after August 7.

There were 12.5 square feet of bark surface enclosed by each cage, or a total of 87.5 square feet for the seven cages. A total of 427 M. californica adults emerged; therefore the average emergence per square foot of bark surface was 4.88 beetles.

Owing to the small sample it is not practical to attempt to ascertain the period during which the highest percentage of the beetles emerged. There was considerable variation in emergence dates within the samples, due mainly to the differences in brood stages at the time of caging and to the placement of cages on different sides of the trees.

Two trees had cages placed on both their north and south sides. Subsequent emergence data disclosed a delay of about one month in emergence of beetles from the north side of the tree over the south side of the tree, as would be expected. This does not necessarily imply, however, that the difference in emergence of beetles from the north side of the tree over the south side of the tree is always one month. The sample is far too small to be conclusive, and it may very well be found to vary with the years and/or the seasons.

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Table 1.--Tree conditions, M. californica brood stages, and emergence data -- by tree cages, Mount Laguna, California -- May-August 1954

Cage number	DBH (in.)	Caged side of tree	M.c. brood stage at time of caging	Foliage fading	Total M.c. emergence	Midpoint M.c. emergence	First M.c. emergence	Last M.c. emergence	Remarks
1	14	North	0-1/2 larvae	Just fading	1	June 30	6/30	6/30	- - -
2	20	North	Prepupae	Straw	41	July 10	6/20	7/31	Woodpeckered
3	20	South	Prepupae	Straw	71	June 10	5/22	7/10	Woodpeckered
4	12	North	Prepupae-pupae	Straw	82	June 10	5/22	7/17	Woodpeckered
5	36	North	1/2-1 larvae--pupae	Brown	34	June 25	6/6	8/7	Slightly woodpeckered
6	36	South	1/2-1 larvae--pupae	Brown	188	May 25	5/8	8/7	Slightly woodpeckered
7	16	South	0-1 larvae--pupae	Between straw and brown	10	May 25	5/22	6/6	- - -
Total					427				

M.c. = Melanophila californica.

Cages 2 and 3, and 5 and 6 were placed on the opposite sides of the same trees.

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Table 2.--Numbers of insects emerged, by collection date and tree cage number -- Mount Laguna, California -- May-August 1954

Date of collection	Tree cage No. 1		Tree cage No. 2		Tree cage No. 3		Tree cage No. 4		Tree cage No. 5		Tree cage No. 6		Tree cage No. 7		Total	
	M.c.	Other	M.c.	Other	M.c.	Other	M.c.	Other	M.c.	Other	M.c.	Other	M.c.	Other	M.c.	Other
May 8	0	27	0	9	0	12	0	17	0	15	2	1	0	4	2	85
" 22	0	48	0	63	2	16	23	41	0	24	49	3	3	29	77	224
" 29	0	37	0	20	15	12	5	32	0	9	69	5	4	25	93	140
June 6	0	35	0	26	17	16	10	32	4	11	43	1	3	8	77	129
" 10	0	6	0	2	3	2	5	1	2	6	4	0	0	5	14	22
" 20	0	56	2	28	7	22	12	45	3	17	11	6	0	35	35	209
" 30	1	25	7	39	21	13	22	28	10	19	4	18	0	35	65	177
July 10	0	54	11	42	6	27	4	7	4	36	0	22	0	73	25	261
" 17	0	59	19	17	0	21	1	5	3	34	2	9	0	62	25	207
" 31	0	119	2	19	0	34	0	2	5	67	3	24	0	158	10	423
August 7	0	24	0	8	0	9	0	3	3	16	1	13	0	44	4	117
Total	1	490	41	273	71	184	82	213	34	254	188	102	10	478	427	1,994

M.c. = Melanophila californica

Other = Associated insects which have not as yet been determined. This work is now under way and will be made available at a later date.

Very little information can be gained from a comparison of woodpeckered caged trees over non-woodpeckered caged trees, although it seems apparent that the woodpeckers know what they are after. There were a goodly number of beetles emerged from all of the caged trees having woodpecker work evident.

Generally speaking, the further the brood stages have progressed the further the tree has advanced in fading.

From this data, there is no apparent correlation between the brood stages at the time of caging and the subsequent dates of emergence. However, with a larger number of samples it may be possible to show a definite correlation between these two events.

It is apparent from these emergence data that an insecticide having long-lasting residual qualities will be needed. Since emergence has been shown to occur over a three-month interval it will be necessary to provide an effective spray program over this entire period. More than one spray application will probably be required. Spray tests are planned for this summer (1955) which should provide further information in this regard.

To substantiate the emergence data collected during the 1954 season, a replication of that study will be made during the 1955 season.

Berkeley, California
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